Let velocity at D for particle from $A=u$, for particle from $B=u_1$; then $u^2=v^2-2gh$, $u_1^2=v_1^2-2gh$. Now $CE=h\cot A$, $CF=h\cot B$.

$\therefore$ $EF=h\sqrt{[\cot^2A+\cot^2B+2\cot A\cot B\cos(\theta+\varphi)]}=d$.

$CG=\frac{1}{2}\sqrt{[2CE^2+2CF^2-EF^2]}=\frac{1}{2}h\sqrt{[\cot^2A+\cot^2B-2\cot A\cot B\cos(\theta+\varphi)]}=l$.

$\therefore$ $\tan DGC=h/l=\tan C$, where C=angle of projection of coalesced particles at D. Also $DE=h\operatorname{cosec}A$, $DF=h\operatorname{cosec}B$.

$$\therefore\ \cos EDF=\frac{h^2\operatorname{cosec}^2A+h^2\operatorname{cosec}^2B-d^2}{2h^2\operatorname{cosec}A\operatorname{cosec}B}=\cos D.$$

$\therefore$ $\cos D=\sin A\sin B-\cos A\cos B\cos(\theta+\varphi)$.

Let w=the velocity of the two particles after they coalesce.

Then $w=\sqrt{[u^2+u_1^2+2uu_1\cos D]}$.

$\therefore$ Their path is $y=x\tan C-gx^2/2w^2\cos^2C$.

Ordinate of vertex$=w^2\sin^2C/2g$.

Latus rectum$=-2w^2\cos^2C/g$.

Height of latus rectum above $D=\dfrac{w^2}{2g}(\sin^2C-\cos^2C)=\dfrac{w^2}{2g}(1-2\cos^2C)=k$

Height of latus rectum above plane of $AB=h+k$.

131. Proposed by **F. P. MATZ, Sc. D., Ph. D.,** Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

If the distributed weight on the foundations of a building is W lb./(feet)^2, the foundations must be sunk $D=(W/w)\tan^4(\frac{1}{4}\pi-\frac{1}{2}\psi)$ feet deep in earth of density $w$lb./(feet)^3 and angle of repose ψ.

No solution of this problem has been received.

132. Proposed by **T. U. TAYLOR, C. E.,** Department of Engineering, University of Texas, Austin, Tex.

1. A parabola, whose axis is vertical, is described on the vertical face of a reservoir wall. If the vertex O of the parabola is at the bottom of the wall, and the parabola intersects the surface in the points A, B, find the depth of the center of pressure of the water on the parabolic area ABO.

2. In the same problem find the center of pressure on the area included between the horizontal line through O, a vertical through B, and the curve OB.

Solution by **P. H. PHILBRICK, C. E.,** Lake Charles, La.

The general formula for the center of pressure, is

$$\bar{x}=\frac{\int\int hx\,dxdy}{\int\int h\,dxdy}$$

in which h is the depth of any point below the surface.

Let O be the origin, its depth being a, and the ordinate on the surface$=b$.